ISSN 1346-7565 Acta Phytotax. Geobot. 60 (1): 41–46 (2009)

Carex benkei, a New Species of *Carex* (Cyperaceae) from Japan and China

TAKAHIRO SHIMIZU

3-2-1 Uozaki-nakamachi, Higashinada-ku, Kobe 658-0083, Japan

A new species, *Carex benkei* is described on the basis of the specimen from Mt. Tatta-san, Kumamoto Pref., Kyushu, Japan. It is similar to *C. brownii,* but it differs from *C. brownii* in having utricles 1.4 times longer, being stipitate at the base, having a beak two times longer, the beak of the achene with or rarely without an annular appendage and the pistillate scales, excluding the awn, two times longer. It is also similar to *C. transversa*, but it differs in having bidentate, stipitate utricles, the beak of the achene with or rarely without an annular appendage, pistillate scales about two times longer, excluding the awn, and basal sheaths light brown. *Carex benkei* occurs in Japan (Honshu, Shikoku and Kyushu) and China (Anhui Province). A distribution map of the species is given. A key to the three similar species is presented.

Key words: *Carex benkei, Carex brownii, Carex transversa,* Japan, new species

In 1981, I found an unknown sedge in a swamp surrounded by a forest near the coast on the Kii Peninsula, western Honshu, Japan. The plants, here named *Carex benkei,* were similar to *C. transversa* Boott and *C. brownii* Tuck., but the pistillate scales, excluding the awn, were about two times longer than in those two species (Fig. 2D, K & R). The basal sheaths were light brown vs. dark purplish red in *C. transversa* and *C. brownii* (sometimes brown in *C. brownii*)(Fig. 2G, N & U). The utricles were bidentate in the unknown sedge, as they are in *C. brownii* (Fig. 2A & H).

In *C. transversa,* the utricles have been regarded as bidentate (Ohwi 1936, Yoshikawa 1958, Hoshino *et al.* 2002) or bifid (Franchet 1898, Akiyama 1955), although they are obliquely entire (Boott 1856) in living plants as shown in Fig. 2O. Sixty to eighty percent of the utricles split to become bifid (Fig. 2O′) in dried specimens. If *C. transversa* is dried without pressing, the oblique utricle apex remains entire. *Carex transversa* therefore distinctly differs from *C. brownii* and *C. benkei* in the apex of the utricle. Further differences between *C. benkei* and *C. brownii*, noted through field and herbarium studies, are summarized in Table 1.

The late Dr. J. Ohwi examined at least four sheets of *Carex benkei, Mayebara s.n.* (KYO, two sheets; TNS) and *Shinagawa s.n.* (TNS) and annotated them as *Carex brownii* Tuckerm. f. *mediocris* Ohwi f. nov. and *Carex brownii* f. *intermedia* Ohwi f. nov. Neither name was ever published.

I also searched the Chinese literature (e.g. Liang *et al.* 2000), but was unable to find a description that matched the features of *C. benkei.* Here *Carex benkei* is described as a new.

Carex benkei Tak. Shimizu, **sp. nov.** (Figs. 1, 2A–G & 3)

Affinis *Carici brownii* Tuck., sed utriculis 4.1–6 mm longis, rostris 1.4–2.5 mm longis, basi stipitatis, achaenis rostris annulariter appendiculatis raro inappendiculatis, squamis femineis praeter aristis 3–5.7 mm longis differt.

Typus. JAPAN, Kyushu, Kumamto Pref.: at the foot of Mt. Tatta-san, Mangoku, Shimizu-cho, Kumamto-shi, ca. 60–80 m alt., 6 June 1986, *Tak. Shimizu 86-293* (holo-KYO; iso- FU, HYO, KAG, KPM, MAK, OKAY, OSA, SHO, TI, TKPM, TNS, TUS).

Herbs, perennial, densely caespitose. Culms 60–170 cm tall, 1–2.6 mm thick, trigonous, ridges acute, usually scabrous on upper half. Leaf blades linear, 50–88 cm long, 4–8.4 mm wide, scabrous. Basal sheaths light brown. Spikes 2–4, upper ones usually approximate; terminal spike staminate, linear, 1.7–4.5 cm long, 1.5–2.7 mm wide, light brown to light greenish brown, peduncles 0–2.5 cm long; lateral spikes pistillate, densely flowered, cylindrical to narrowly cylindrical, 2–4.6 cm long, 8–9 mm wide, shortly peduncled; lowest spike often remote, peduncle short to long

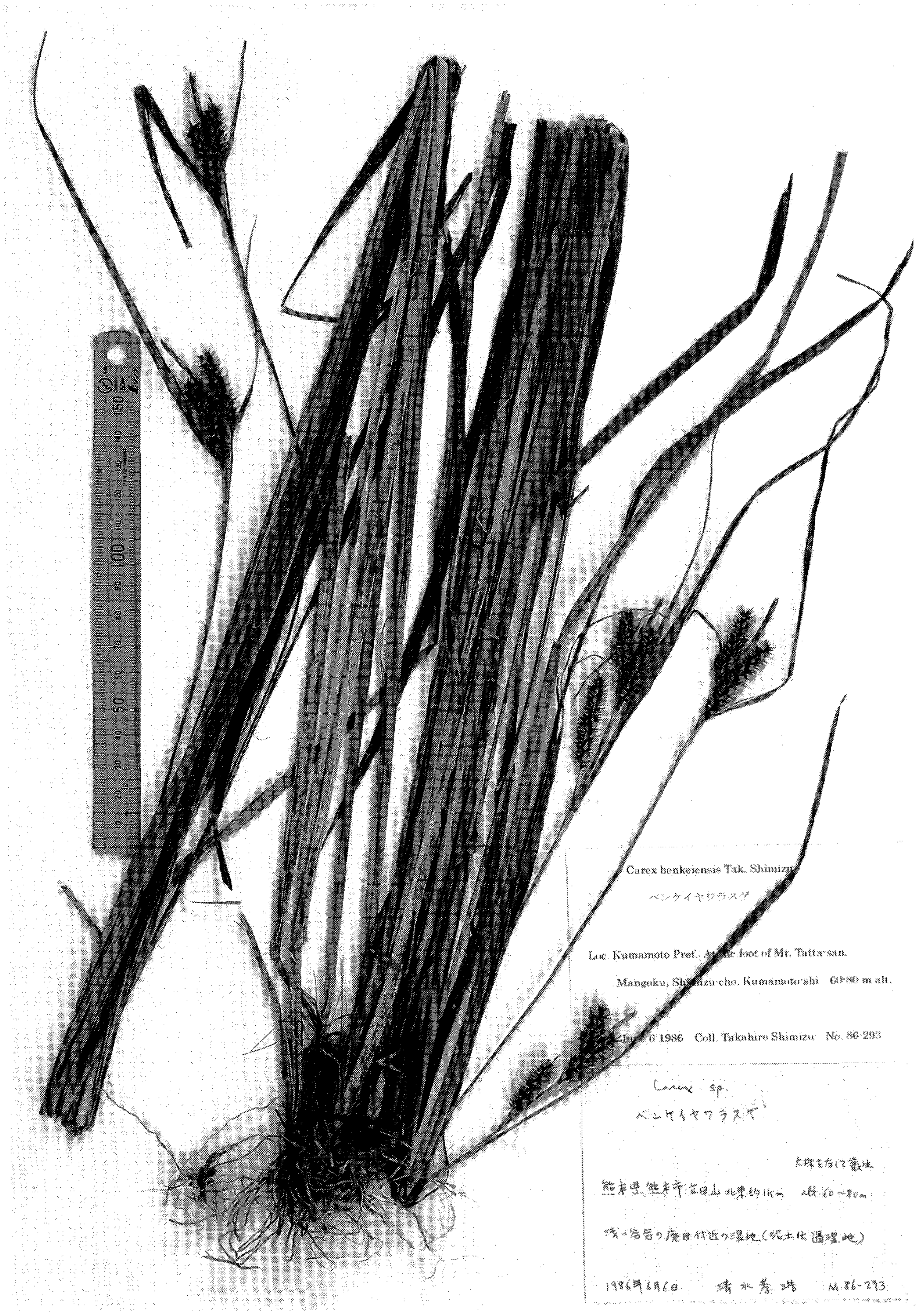
150
100
50
Carex benkeiensis Tak. Shimizu
ベンケイヤワラスゲ
Loc. Kumamoto Pref.: At the foot of Mt. Tatta-san,
Mangoku, Shimizu-cho, Kumamoto-shi 60-80 m alt.
June 6 1986 Coll. Takahiro Shimizu No. 86-293
Carex sp.
ベンケイヤワラスゲ
大株をなして叢生
熊本県 熊本市 立田山 北東約1km alt. 60~80m
浅い谷筋の廃田付近の湿地（泥土状過湿地）
1986年6月6日 清水孝浩 No. 86-293

FIG. 1. Holotype of *Carex benkei* (*Tak. Shimizu 86-293* [KYO]).

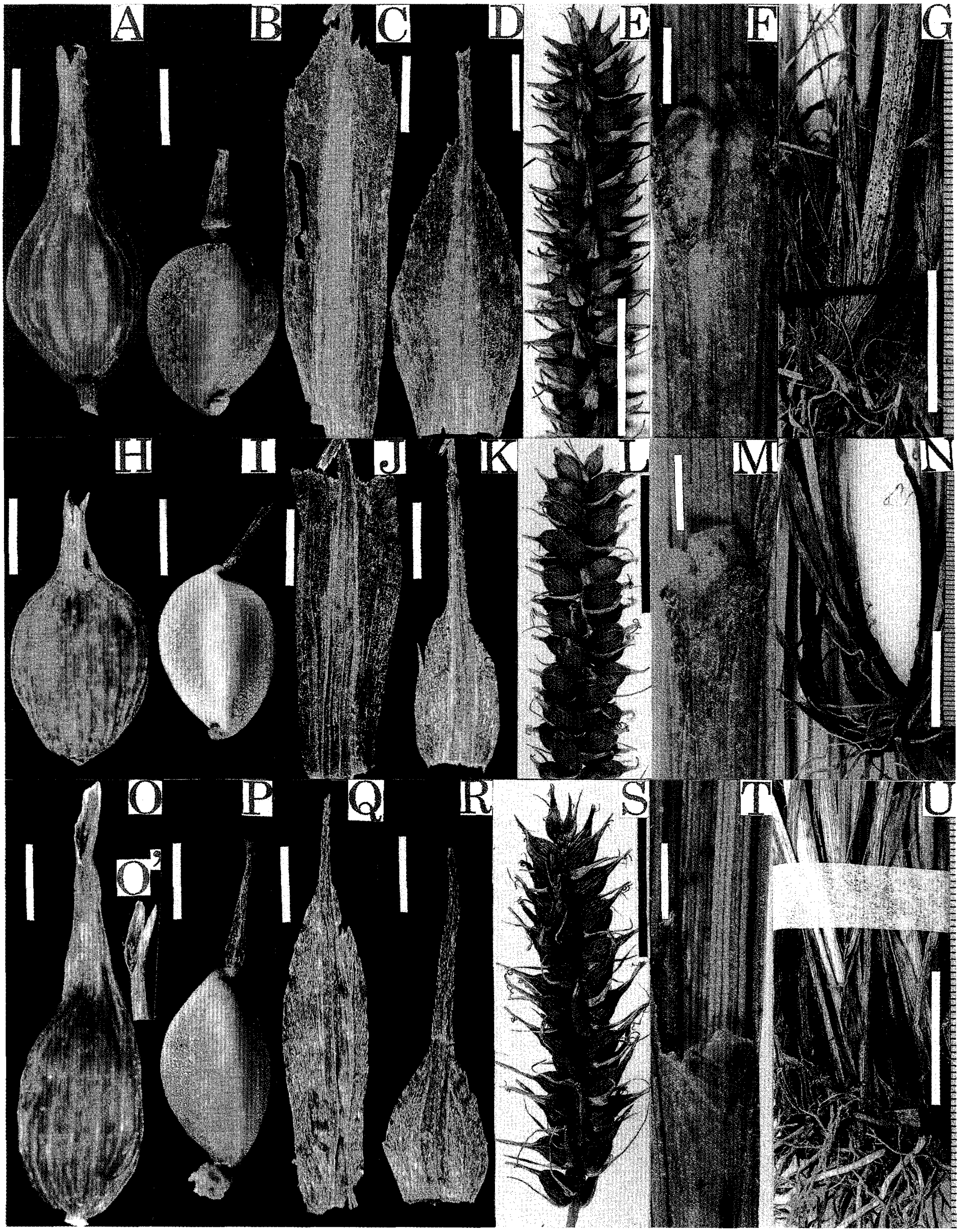

FIG. 2. Abaxial view of utricles (A, H & O. bar = 1 mm), bifid apex of utricle from same specimen (O′), achenes (B, I & P. bar = 1 mm), staminate scales (C, J & Q. bar = 1 mm), pistillate scales (D, K & R. bar = 1 mm), lateral spikes (E, L & S. bar = 1 cm), upper part of lowest bract sheaths (F, M & T. bar = 1 mm) and basal sheaths (G, N & U. bar = 2 cm). *Carex benkei* (A–G: Mt. Tatta-san, Kumamoto Pref., *Tak. Shimizu 86-293* [KYO]), *C. brownii* (H–N: Motegi-cho, Tochigi Pref., *Tak. Shimizu 08-120* [SHO]), *C. transversa* (O–U: Kasuga-cho, Hyogo Pref., *H. Imai s.n.* [SHO]).

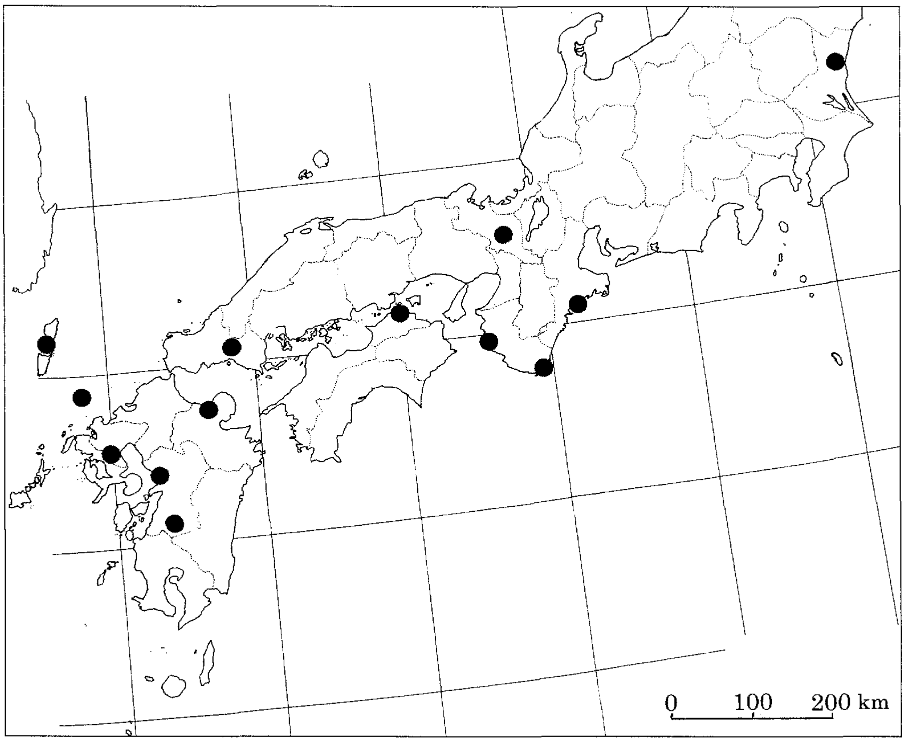

FIG. 3. Distribution map of *Carex benkei* in Japan.

(0.2–16 cm long); lowest bracts 11–44 cm long, 1.6–7.3 mm wide, much longer than terminal spike; sheath of lowest bract 0.2–6.5 cm long, distinctly to slightly scabrous in the distal part. Staminate scales 5–7 mm long excluding awn, scales and apex of scales variable in shape, brown to light greenish brown; awn 0–2.5 mm long. Pistillate scales 3–5.7 mm long excluding awn, narrowly oblong to oblong, acute to obtuse or emarginate at apex; awn 1–4.2 mm long. Utricles longer than or nearly as long as scales, 4.1–6 mm long, 1.6–2.3 mm wide, 1.5–2 mm thick, rhom-

TABLE 1. Comparison of morphological characters among *Carex benkei* and its allies.

	C. benkei	*C. brownii*	*C. transversa*
Utricle			
length	4.1–6 mm	3–4.3 mm	5–6.5(–7.5) mm
apex	bidentate	bidentate	oblique, entire
beak	1.4–2.5 mm long	0.7–1.2 mm long	2–3.8 mm long
base (when ripe)	stipitate	not stipitate	not or slightly stipitate
Beak of achene	with or rarely without an annular appendage	without an annular appendage	without an annular appendage
Saminate scale except awn	5–7 mm long	3–5 mm long	3–6 mm long
Pistillate scale except awn	3–5.7 mm long	1.3–2.5 mm long	1.5–3 mm long
Upper part of lowest bract sheath	distinctly to slightly scabrous	scabrous or rarely smooth	smooth or rarely slightly scabrous
Culm, upper half	usually scabrous, three ridges acute	usually scabrous, three ridges acute	usually smooth, three ridges obtuse or often one ridge acute
Basal sheath	light brown	dark purplish red sometimes brown	dark purplish red

boid, ellipsoid or broadly ellipsoid, indistinctly trigonous, brown to dark brown, olivaceous green, often greasily lustrous, with distinct nerves, distinctly stipitate, beak bidentate, 1.4–2.5 mm long. Achenes somewhat loosely enclosed in utricle, 2–2.4 mm long (excluding beak and stipe), 1.4–1.85 mm wide, broadly ellipsoid or rhomboid, trigonous, beak with or rarely without an annular appendage. Stigmas 3.

Habitat. Swampy grasslands with dense mixture of many sedges, grasses and herbs surrounded by broadleaved forests; usually near the coast.

Japanese name. Benkei-yawarasuge.

Etymology. The epithet 'benkei' relates the robust habit of *Carex benkei* to Saito Musashibo Benkei (1155–1189), a Japanese warrior monk of the twelfth century, commonly known as 'Benkei' and depicted as a big man of a great strength and loyalty.

Additional specimens examined. CHINA. Anhui Prov.: 1940, *F. Maekawa s.n.* (TI).

JAPAN. **Honshu.** Ibaraki Pref.: Zuiryu-cho, Hitachioota-shi, 1 Jun. 2008, *Tak. Shimizu et al. 08-131* (KYO). —Mie Pref.: Kaino, Kiinagashima-cho, Kitamuro-gun, 26 Apr. 1972, *Y. Higuchi 6491* (OSA); *ibid.,* 4 May 1981, *Tak. Shimizu 81-272* (SHO); *ibid.,* 18 May 1987, *Tak. Shimizu 87-1134* (KYO, TI), *K. Seto 32601* (OSA); *ibid.,* 13 May 1998, *K. Seto 49018* (OSA); *ibid.,* 15 May 2004, *Tak. Shimizu 04-37* (KYO, TI), *04-38* (KYO, TNS); *ibid.,* 26 May 2004, *Tak. Shimizu 04-61* (KYO, SHO), *04-62* (KYO); *ibid.,* 5 May 2005, *Tak. Shimizu 05-57* (KYO); *ibid.,* 30 Apr. 2006, *K. Yamawaki 14815* (KYO), *14816* (KYO); Funatsu, Miyama-cho, Kitamuro-gun, 18 May 1999, *K. Yamamoto 3226* (KYO), *3229* (OSA); *ibid.,* 15 May 2004, *Tak. Shimizu 04-33* (KYO); *ibid.,* 6 Jun. 2008, *Tak. Shimizu 08-138* (KYO); Yaguchiura, Miyama-cho, Kitamuro-gun, 27 May 2004, *Tak. Shimizu 04-70* (KYO); Funakoshi, Miyama-cho, Kitamuro-gun, 30 Apr. 1986, *K. Yamamoto 12* (OSA); *ibid.,* 17 May 1987, *K. Seto 32517* (OSA), *32522* (OSA), *Tak. Shimizu 87-1109* (FU, KYO, OKAY, TI, TNS). —Wakayama Pref.: Naka, Yura-cho, Hidaka-gun, 7 May 1905, *T. Hara s.n.* (MAK); *ibid.,* 18 May 1906, *T. Hara 55* (MAK); Tahara, Koza-cho, Higashimuro-gun, 25 May 1996, *T. Fujii 5662* (HYO); *ibid.,* 18 May 2001, *S. Fujii 8517* (KYO, MAK, OSA, SHO). —Kyoto Pref.: Nakachi, Keihoku-cho, Kitakuwata-gun, 5–7 Jun. 1996, *T. Fukuhara 7283* (KYO). —Yamaguchi Pref.: Hanouchi, Kano-cho, Tsuno-gun, 10 May 1964, *H. Masaki 31098* (Yamaguchi Prefectural Museum). **Shikoku.** Kagawa Pref.: Suribachidani, Takamatsu (Takamatsu-shi, Miyawaki-cho), 4 Jul. 1935, *Y. Ujike 66251* (TNS). **Kyushu.** Saga Pref.: Nagashima, Takeo-shi, 7 May 2001, *S. Iwamura 13265* (KYO). —Nagasaki Pref.: Tamatsugeura, Mitsushima-cho, 22 May 2006, *Tak. Shimizu 06-127* (KPM, KYO, TI), *06-128* (KYO); *ibid.,* 30 May 2006, *Tak. Shimizu 06-139* (KYO, TNS); *ibid.,* 29 May 2006, *Tak. Shimizu 06-141* (KYO); *ibid.,* 10 Jun. 2008, *Tak. Shimizu 08-143* (KYO); Konoseura, Mitsuhima-cho, Shimoagata-gun, 22 May 2006, *Tak. Shimizu 06-130* (KYO); *ibid.,* 3 May 2007, *Hoshino et al. 21300* (OKAY); *ibid.,* 10 Jun. 2008, *Tak. Shimizu 08-152* (KYO); Itose, Toyotama-cho, Shimoagata-gun, 1 May 2003, *Y. Takano NAO125743* (KPM); Shinjyo, Katsumoto-cho, Iki-gun, 14 May 1955, *T. Shinagawa s.n.* (TNS). —Oita Pref.: Miyasako, Usa-shi, 31 May 2006, *Tak. Shimizu 06-144* (KYO), *06-145* (KYO, TI); *ibid.,* 18 May 2008, *Tak. Shimizu 08-86* (KYO), *08-88* (KYO, TNS), *08-89* (KYO), *08-94* (KYO, TI); *ibid.,* 26 May 2008, *Tak. Shimizu 08-102* (KYO), *08-104* (KYO), *08-105* (KYO, TI). —Kumamoto Pref.: Mt. Tatta-san, Shimizu-cho, Kumamto-shi, 3 Jun. 1986, *Tak. Shimizu 86-292* (KYO); *ibid.,* 7 Jun. 2004, *Ch. Sato & M. Baba 04-2* (KYO); *ibid.,* 4 Jun. 2005, *Tak. Shimizu 05-137* (KYO); Higo, Menda (Menda-cho, Kuma-gun), 31 May 1931, *K. Mayebara s.n.* (KYO [two sheets], TNS).

Key to separate *Carex benkei, C. brownii* and *C. transversa*

1. Apex of utricles oblique, entire; upper part of lowest bract sheaths smooth or rarely slightly scabrous; ridges of culms usually smooth and obtuse, or one ridge acute, in upper half .... *C. transversa*
1. Apex of utricles bidentate; upper part of lowest bract sheaths distinctly to slightly scabrous or rarely smooth; ridges of culms usually scabrous and acute in upper half 2
    2. Staminate scales 5–7 mm long excluding awn; pistillate scales 3–5.7 mm long excluing awn; utricles 4.1–6 mm long, beak 1.4–2.5 mm long, stipitate at base; beak of achenes with or rarely without an annular appendage .... *C. benkei*
    2. Staminate scales 3–5 mm long excluding awn; pistillate scales 1.3–2.5 mm long excluding awn; utricles 3–4.3 mm long, beak 0.7–1.2 mm long, not stipitate at base; beak of achenes without an annular appendage .... *C. brownii*

I am grateful to Prof. N. Fukuoka, University of Hyogo, for critically reading the manuscript. My thanks are also due to Ch. Sato and M. Baba, Kumamoto Pref., for guiding me in the field and for providing specimens, to M. Arakane, Oita Pref., for giving locality information, to S. Iwamura, Saga Pref. and to K. Yamawaki, Mie Pref. for providing specimens, to T. Noguchi, Tochigi Pref., for guiding me to and for providing useful information, and to Prof. H. Ikeda and Dr. A. Shimizu, University Museum, University of Tokyo, for searching the literature on Chinese sedges. I thank the directors and the curators of HYO, KPM, KYO, MAK, OKAY, OSA, SHO, TI, TKPM, TNS for permitting me to examine specimens.

References

Akiyama, S. 1955. Carices of the Far Eastern Region of Asia. Hokkaido University, Sapporo. (in Japanese)

Boott, F. 1856. *Carex*. *In*: Gray, A. (ed.), Accounts of the botanical specimens. Narr. Exped. China Japan 2: 322–329.

Franchet, A. R. 1898. Les *Carex* de l'Asie Orientale. Nouv. Arch. Mus. Hist. Nat. sér. 3, 10: 39–111.

Hoshino, T., T. Masaki & M. Nishimoto. 2002. Illustrated Sedges of Okayama. Sanyo Shinbunsha, Okayama. (in Japanese)

Liang, S.-Y., L.-K. Dai, Y.-C. Tang & P.-C. Li. 2000. *Carex*. *In*: Dai, L.-K. & S.-Y. Liang (eds.), Fl. Reip. Pop. Sin. 12(2): 56–528.

Ohwi, J. 1936. Cyperaceae japonicae 1. A synopsis of the Caricoideae of Japan. Mem. Coll. Sci. Kyoto Imp. Univ., Ser. B, Biol. 11: 229–530.

Yoshikawa, J. 1958. Icones of Japanese *Carex*, vol. 2. Hokuriku no Shokubutu no Kai, Kanazawa. (in Japanese)

Received September 8, 2008; accepted January 6, 2009